

## PATENT ABSTRACTS OF JAPAN

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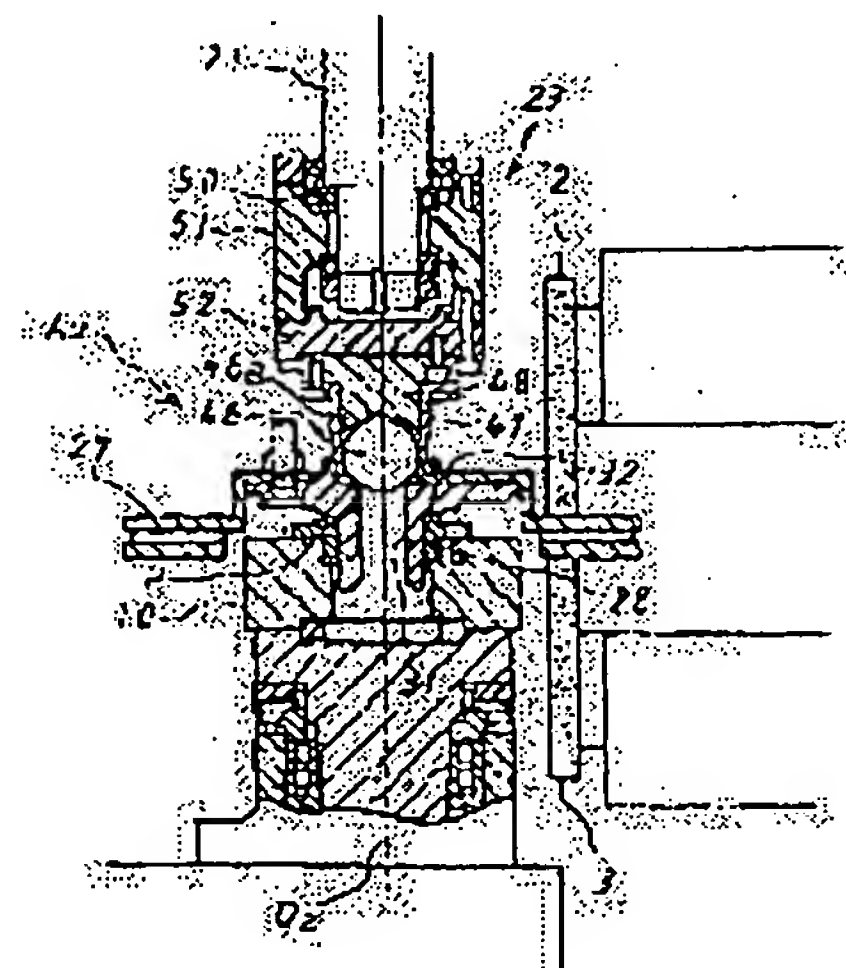
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## (54) VERTICAL DOUBLE HEAD SURFACE GRINDING MACHINE FOR BRAKE DISK WORKING

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a vertical double head surface grinding machine having a clamp device capable of fixing/retaining a work at an exact fixing position in the stable state even when the shape of an upper surface of the work is complex and clamp the area is small.

SOLUTION: The grinding machine is provided with a pair of upper and lower grinding wheels 2, 3 rotating around a vertical axis; a work retaining fixture 10 retaining the work W to a predetermined position and rotating itself, and a clamp device 12 pressing the work W to the work retaining fixture 10. Both upper and lower end surfaces are simultaneously surface-ground by inserting the work retained by the work retaining fixture 10 between both grinding wheels 2, 3. The clamp device 12 is provided with a pressing unit 23 rotatable around an axis O2 of self-rotation of the work retaining fixture 10 on a clamp rod 21 of a lifting cylinder 22 through a bearing 50. The pressing unit 23 has a steel ball abutting to a central recessed part of the upper surface of the work.



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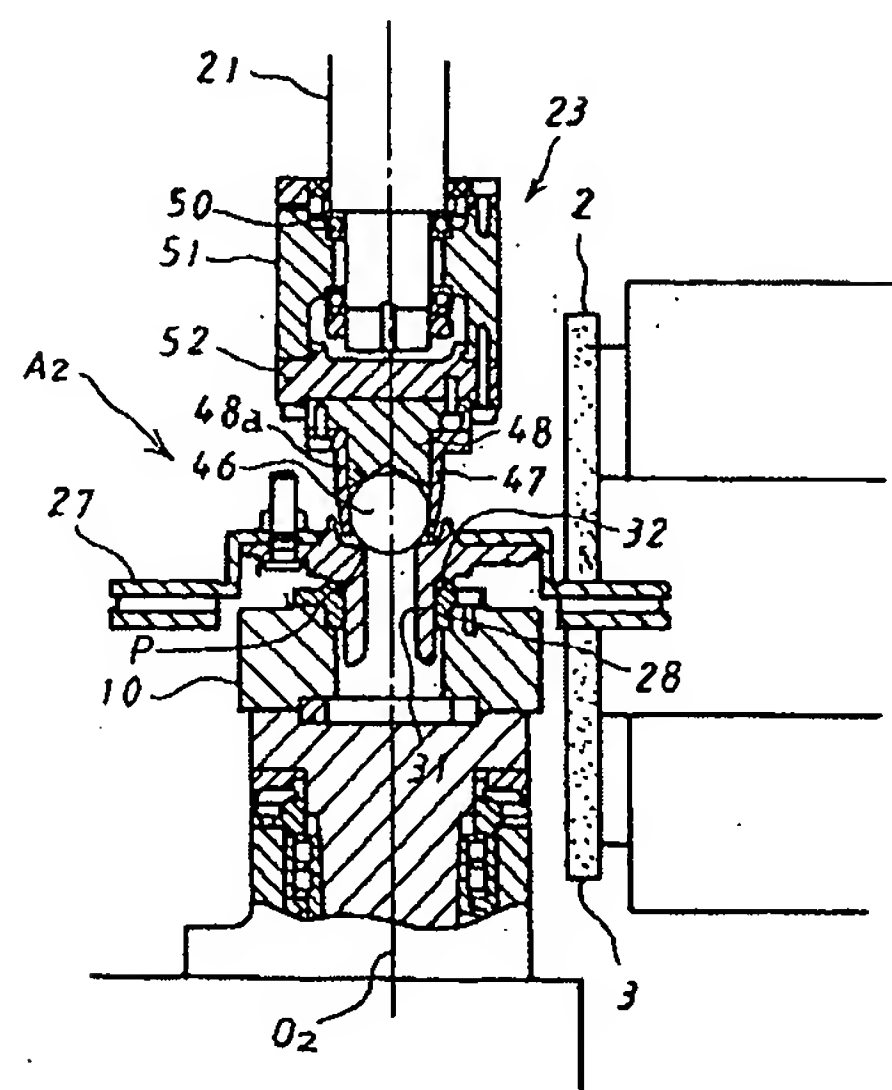
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[Drawing 3]



[Translation done.]

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2. \*\*\*\* shows the word which can not be translated.
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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]

The invention in this application relates to amelioration of the clamp equipment in vertical-type both the head surface grinder that carries out grinding about vertical-type both the head surface grinder that carries out grinding of the vertical both-ends side of the work piece held at the work-piece maintenance fixture to coincidence with the emery wheel of one pair of upper and lower sides, making a work piece rotate with a work-piece maintenance fixture especially.

[0002]

[Description of the Prior Art]

Conventionally, the clamp equipment which fixes a work piece to the work-piece maintenance fixture which can be rotated is equipped with metallic ornaments with \*\*, such as a clamp pawl or a clamp arm, free [ rise and fall ], and fixes them to the position of a work-piece maintenance fixture by pressing metallic ornaments with \*\* against the part where a work-piece top face is suitable from the upper part.

[0003]

Especially, it is body of revolution like the brake disc for automobiles, and at a work piece which does not bend even if it has rigidity with it and holds in the center section, fix the center section of the work piece to a work-piece maintenance fixture, a work piece is made to rotate with a work-piece maintenance fixture, and the periphery part of a work piece is inserted between emery wheels. [ a large and grinding-ed side and ] [ fixed ]

[0004]

[Problem(s) to be Solved by the Invention]

When the area of the part which the configuration on the top face of a work piece is complicated, or is clamped when carrying out grinding, making a work piece rotate with a work-piece maintenance fixture is small, it is difficult to hold a work piece in the condition of having been stabilized in the exact fixed position, and it difficult to always maintain grinding precision.

[0005]

[Objects of the Invention]

The configuration on the top face of a work piece is complicated, or the invention in this application aims at offering vertical-type both the head surface grinder that can carry out fixed maintenance of the work piece in the condition of having been stabilized in the exact fixed position even when the area of the part clamped was small.

[0006]

[Means for Solving the Problem]

The emery wheel of one pair of upper and lower sides which invention of this application claim 1 publication rotates to the circumference of a perpendicular axis, While holding a work piece in a predetermined location, it has the work-piece maintenance fixture which can rotate, and clamp equipment which presses down a work piece to a work-piece maintenance fixture. In vertical-type both

the head surface grinder that carries out surface grinding of the vertical both-ends side to coincidence by inserting the work piece held at the above-mentioned work-piece maintenance fixture among both grinding stones the above-mentioned clamp equipment The rise-and-fall member of a rise-and-fall actuator is equipped with the unit with \*\* free [ the circumference rotation of a rotation axis of a work-piece maintenance fixture ] through bearing, and this unit with \*\* is characterized by having the shot which contacts the central crevice on the top face of a work piece.

[0007]

In vertical-type both the head surface grinder according to claim 1, invention according to claim 2 is characterized by being fixed to both ball maintenance cylinders by the cone receptacle side of the ball presser-foot member attached removable from the upper part while a shot is inserted in the shape of a lower part protrusion into a ball maintenance cylinder.

[0008]

Invention according to claim 3 is characterized by having prepared the time stop member which engages with some work pieces and prevents rotation of the work piece to a work-piece maintenance fixture in the top face of a work-piece maintenance fixture in the vertical-type surface grinder according to claim 1 or 2.

[0009]

[Embodiment of the Invention]

Drawing 1 is the side elevation of vertical-type both the head surface grinder that applied the invention in this application, it has contained one pair of emery wheels 2 and 3 which counter up and down in the body case 1, and the up-and-down emery wheels 2 and 3 have fixed it, respectively to the wheel spindles 4 and 5 of the upper and lower sides arranged on the same perpendicular axis O3. Both the wheel spindles 4 and 5 are carrying out interlocking connection at the power transmission device so that it may rotate to hard flow mutually, while being constituted by the elevator style possible [ vertical directional movement ], respectively.

[0010]

the index table 6 for work-piece supply fixes to the upper limit of the perpendicular table driving shaft 7 -- having -- this table driving shaft 7 -- the support case 8 of a cylindrical shape -- bearing -- minding -- the table revolving-shaft alignment O -- while being supported pivotable the 1 surroundings, interlocking connection is carried out through the driving mechanism which is not illustrated at the drive motor.

[0011]

On the index table 6, it has clamp equipment 12 which fixes the work piece W on one pair of the work-piece maintenance fixture 10 and each work-piece maintenance fixture 10 from the upper part.

[0012]

It is supported by the fixture support case 15 of a cylindrical shape possible [ the circumference rotation drive of the rotation axis O2 ], and when an index table 6 half-rotates, both the work-pieces maintenance fixture 10 can be repositioned between the grinding location A2 by the side of an emery wheel, and the attachment-and-detachment location A1 of the opposite side, while it is arranged by 180-degree phase contrast at the circumference of the table axis O1.

[0013]

Clamp equipment 12 consists of units 23 with \*\* with which one pair of cylinders 22 which have the extensible clamp rod 21 below, and the lower limit section of each clamp rod 21 were equipped. It is fixed to the bracket 24 fixed to the top face of an index table 6, and each cylinder 22 is rotated to the circumference of the table revolving-shaft heart O1 with the work-piece maintenance fixture 10 by rotation of an index table 6 while it is arranged on the same axis as the rotation axis O2 of the work-piece maintenance fixture 10, respectively.

[0014]

Drawing 2 is the longitudinal-section enlarged drawing of the work-piece maintenance fixture 10 in the attachment-and-detachment location A1, and a work piece W. It is a brake disc for vehicles, the work piece W consists of a hub 26 which has flange 26a in one, and an annular disk 27 which fixed to the



above-mentioned flange 26a, and surface grinding of the vertical both-ends side of a disk 27 is carried out.

[0015]

In the fixture support case 15, the rotation shaft 30 is supported pivotable through bearing 29, the work-piece maintenance fixture 10 is fixed to the upper limit side of the rotation shaft 30 on the same rotation axis O2, and although the lower limit section of the rotation shaft 30 does not illustrate, it is carrying out interlocking connection through the gear driving mechanism at the drive motor.

[0016]

While the work-piece maintenance fixture 10 is formed annularly, the positioning piece 28 annular on the top face is being fixed to the coaxial heart. The annular work-piece datum plane 32 where the inferior surface of tongue of flange 26a of a work piece W contacts the top face of the positioning piece 28 is formed in the shape of an upper part protrusion, and the inner skin 31 of the positioning piece 28 is set as the dimension into which the hub 26 of a work piece W fits. The work-piece maintenance fixture 10 is equipped with the time check pin 37 in the shape of an upper part protrusion, in order to prevent rotation of the work piece W to the work-piece maintenance fixture 10. Moreover, this time check pin 37 By [ to which it is energized up with both the springs 42, and the upper limit section engages with the mounting bolt 45 of a work piece W, or flange 26a ] being inserted in the rod insertion hole 40 formed in the work-piece maintenance fixture 10 possible [ vertical directional movement ] The baffle of the work piece W is carried out to the work-piece maintenance fixture 10.

[0017]

Drawing 3 is the longitudinal-section enlarged drawing of the unit 23 with \*\* of the clamp equipment in the grinding location A2, and the work-piece maintenance fixture 10. The unit 23 with \*\* the shot 46 which contacts the periphery of the central hole of a work piece W from the upper part -- this -- a shot 46 to the letter of a lower part protrusion with the ball maintenance cylinder 47 which carries out fitting support The ball presser foot 48 which has cone receptacle side 48a which contacts the top face of a shot 46, The bearing electrode holder 51 supported by the lower limit section of the clamp rod 21 free [ the circumference rotation of the rotation axis O2 ] through bearing 50, It has the lower lid 52 grade which fixed on the inferior surface of tongue of the bearing electrode holder 51, and the shot 46, the ball maintenance cylinder 47, the ball presser foot 48, and the bearing electrode holder 51 are placed neatly by each on the rotation axis O2 of the work-piece maintenance fixture 10, and the coaxial heart.

[0018]

A lower part is formed in the shape of [ of a minor diameter ] a taper, and, as for the inner skin in the lower half of the ball maintenance cylinder 47, the shot 46 is held in the shape of a lower part protrusion by this taper part. The ball presser foot 48 fits in from the upper part in the ball maintenance cylinder 47, and is combined with the bottom lid 52 of the above in the shape of a lower part protrusion with the ball maintenance cylinder 47.

[0019]

[Function]

In drawing 1 , the unit 23 with \*\* is forced on the top-face center section of the work piece W in the attachment-and-detachment location A1 by raising the unit 23 with \*\*, carrying a work piece W on the work-piece maintenance fixture 10, and dropping the clamp rod 21.

[0020]

In drawing 2 , at the time of work-piece wearing, the hub 26 of a work piece W fits into the inner skin 31 of the positioning piece 28, the inferior surface of tongue of flange 26a contacts the annular criteria receptacle side 32 of the positioning piece 28, and the time check pin 37 is located by the location which shifted from the mounting bolt 45 to the hoop direction. By dropping the unit 23 with \*\* in this condition, a shot 23 carries out a pressure welding to the upper limit edge P of the inner skin (central hole) of a hub 26, and positioning immobilization of the work piece W is carried out like drawing 3 in a predetermined location.

[0021]

Since the pressurization part by the shot 46 is settled in the criteria abutment 32, exact positioning

stabilized by the work piece is made at the time of a clamp.

[0022]

It is repositioned by the grinding location A2 when an index table 6 half-rotates after the completion of a clamp in the attachment-and-detachment location A1 of drawing 1.

[0023]

In drawing 3, repositioning working and emery wheels 2 and 3 have retired up and down, respectively, and carry out surface grinding of the vertical both-ends side to coincidence by making the work-piece maintenance fixture 10 rotate after repositioning by rotating a work piece W to the circumference of the rotation axis O2, and narrowing spacing of the up-and-down rotation emery wheels 2 and 3.

[0024]

During a grinding activity, although a shot 46 also rotates to the circumference of the rotation axis O2 with a work piece W, since the unit 23 with \*\* is supported through bearing 50 to the clamp rod 21, the unit 23 with \*\* whole rotates to the circumference of the rotation axis O2 to the clamp rod 21. That is, slipping is not generated between a shot 46 and cone abutment 48a at the same time slipping does not occur between a shot 46 and a work piece W, but wear of a shot 46 is suppressed.

[0025]

Moreover, since the baffle of the work piece W is carried out to the work-piece maintenance fixture 10 with the time check pin 45, a work piece W is not turned by grinding force to the work-piece maintenance fixture 10.

[0026]

If the grinding of a work piece W is completed, when the up-and-down emery wheels 2 and 3 retreat from the vertical end face of a work piece W up and down, respectively, rotation of the work-piece maintenance fixture 17 stops with \*\* and an index table 6 half-rotates, it will be repositioned by the attachment-and-detachment location A1 of drawing 1, and the unit 23 with \*\* will go up.

[0027]

[The gestalt of other operations of invention]

(1) It is also possible to use various actuators, such as a pinion rack type or a rocking lever type, by making into a driving source the motor other than the cylinder which has a clamp rod like drawing 1 as a rise-and-fall actuator.

[0028]

[Effect of the Invention]

According to [ as explained above ] the invention in this application

(1) In vertical-type both the head surface grinder equipped with the work-piece maintenance fixture 10 which has a rotation device, and the clamp equipment 12 which presses down a work piece W from the upper part to the work-piece maintenance fixture 10 The above-mentioned clamp equipment 12 to the clamp rod 21 which goes up and down by the rise-and-fall member 22 of a rise-and-fall actuator, for example, a cylinder It has the unit 23 with \*\* through bearing 50 free [ the circumference rotation of the rotation axis O2 of the work-piece maintenance fixture 10 ]. This unit 23 with \*\* Since it has the shot 46 which contacts the central crevice on the top face of a work piece, even if a configuration with a complicated top face or a clamp part is the work piece of a narrow configuration compared with the clamp equipment equipped with clamping caps, such as a clamp pawl, like before While being able to perform exact positioning in the criteria abutment 32 which carries out contact support of the work piece W, a work piece can be fixed in the condition of always having been stabilized, and thereby, grinding precision is stabilized.

[0029]

(2) Since the unit 23 with \*\* is attached in the circumference of the rotation axis O2 of the work-piece maintenance fixture 10 pivotable at the rise-and-fall member (clamp rod 21), during a grinding activity, it does not produce slipping between a shot 46 and a work piece W, and wear of a shot has them. [ few ]

[0030]

(3) if it constitutes so that it may fix from the upper part by cone receptacle side 48a of the ball presser foot 48 attached in the ball maintenance cylinder 47 removable while inserting a shot 46 in the shape of

a lower part protrusion into the ball maintenance cylinder 47, while the maintenance of exchange of assembly and a shot etc. will become easy -- a shot -- the very thing can be cheaply purchased with a commercial item.

[0031]

(4) If the time stop member (time check pin 45) which engages with some work pieces W and prevents rotation of the work piece W to the work-piece maintenance fixture 10 is prepared in the top face of the work-piece maintenance fixture 10, rotation of the work piece to the work-piece maintenance fixture under grinding activity can be prevented certainly, and grinding precision will improve also by this.

[Brief Description of the Drawings]

[Drawing 1] It is the side elevation of vertical-type both the head surface grinder that applied the invention in this application.

[Drawing 2] It is drawing of longitudinal section of the work-piece maintenance fixture in an attachment-and-detachment location, and a work piece.

[Drawing 3] It is drawing of longitudinal section of the work-piece maintenance fixture in a grinding location, a work piece, and a unit with \*\*.

[Description of Notations]

2 Top Emery Wheel

3 Bottom Emery Wheel

4 Top Wheel Spindle

5 Bottom Wheel Spindle

6 Index Table

10 Work-Piece Maintenance Fixture

12 Clamp Equipment

21 Clamp Rod (an Example of Rise-and-Fall Member)

22 Cylinder (an Example of Rise-and-Fall Actuator)

23 Unit with \*\*

28 Positioning Piece

32 Annular Criteria Abutment

37 Time Check Pin

46 Shot

47 Ball Maintenance Cylinder

48 Ball Presser Foot

48a Cone receptacle side

50 Bearing

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[Translation done.]